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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/711,764

10/04/2004

Toshiharu Furukawa

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08/11/2006

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EXAMINER

STARK, JARRETT J

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 08/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/711,764

Applicant(s)

FURUKAWA ET AL.

Examiner

Jarrett J. Stark

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 01 August 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8, 10-12, 14-21 and 23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-12, 14-21, and 23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Response to Amendment*

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Dahl et al. (US 2002/0130407).

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1-8, 10-12, 14-21, and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Dahl et al. (US 2002/0130407).**

**Regarding claim 1, Dahl discloses a dielectric material for forming a structure of an integrated circuit, said dielectric material comprising:**

**a plurality of fluorinated carbon nanostructures (Dahl ¶ [0074]); and**

**a copolymer layer binding said fluorinated carbon nanostructures to define the dielectric material (Dahl ¶ [0075]).**

**Regarding claim 3,** Dahl discloses the dielectric material of claim 1 wherein said fluorinated carbon nanostructures comprise a plurality of fluorinated carbon nanotubes (Dahl ¶ [0007]).

**Regarding claim 4,** Dahl discloses the dielectric material of claim 1 wherein said dielectric material has a dielectric constant of less than about 3 (Dahl ¶ [0139]).

**Regarding claim 5,** Dahl discloses the dielectric material of claim 1 wherein said structure further comprises at least one conductive feature disposed in said dielectric material (Dahl ¶ [0135] – fluorinated carbon is conductive feature).

**Regarding claim 6,** Dahl discloses the dielectric material of claim 1 wherein said fluorinated carbon nanostructures comprise a plurality of fluorinated carbon buckyballs (Dahl ¶ [0007] – fullerenes are buckyballs).

**Regarding claim 7,** Dahl discloses the dielectric material of claim 1 further comprising a cap layer on said dielectric material (Dahl Figure 9 & ¶ [0139] – dielectric layers are [910 & 911] and capped with layers [907 & 912]).

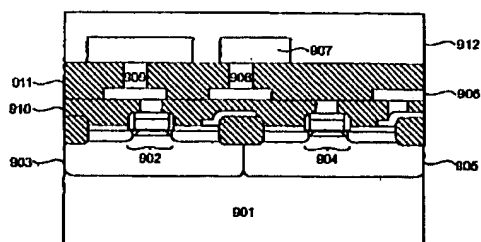


FIG. 9

**Regarding claim 8,** Dahl discloses the dielectric material of claim 7 wherein said fluorinated carbon nanostructures, said copolymer layer, and said cap layer have an effective dielectric constant of less than about 3 (Dahl ¶ [0139]).

**Regarding claim 10,** Dahl discloses the dielectric material of claim [[7]] 1 wherein said fluorinated carbon nanostructures and said copolymer layer have an effective dielectric constant of less than about 3 (Dahl ¶ [0139]).

**Regarding claim 11,** Dahl discloses a semiconductor structure formed on a substrate, comprising:

a dielectric layer comprising a plurality of fluorinated carbon nanostructures and a copolymer layer binding said fluorinated carbon nanostructures(Dahl ¶ [0074 - 75]); and

at least one conductive feature in said dielectric layer, said at least one conductive feature electrically isolated from nearby conductive features by portions of said dielectric layer (Dahl Figure 9 & ¶ [0139]).

**Regarding claim 12,** Dahl discloses the semiconductor structure of claim 11 wherein said dielectric layer has an exposed surface, and further comprising:

a cap layer of an insulating material at least partially covering said exposed surface, said cap layer having a top surface, and said conductive feature having a top surface substantially coplanar with said top surface of said cap layer (Dahl Figure 9 – [910 & 911] → Dielectric layer, [907] → interconnect & [912] → passivation layer).

**Regarding claim 14,** Dahl discloses the semiconductor structure of claim 11 wherein said fluorinated carbon nanostructures comprise a plurality of fluorinated carbon nanotubes (Dahl ¶ [0007]).

**Regarding claim 15,** Dahl discloses the semiconductor structure of claim 11 wherein said dielectric layer has a dielectric constant of less than about 3 (Dahl ¶ [0139]).

**Regarding claim 16,** Dahl discloses the semiconductor structure of claim 11 wherein said structure comprises a plurality of conductors electrically isolated by said layer of said dielectric material (Dahl Figure 9 – [910 & 911] → Dielectric layer, [907] → interconnect & [912] → passivation layer).

**Regarding claim 17,** Dahl discloses the semiconductor structure of claim 11 wherein said fluorinated carbon nanostructures comprise a plurality of fluorinated carbon buckyballs (Dahl ¶ [0007] – fullerenes are buckyballs).

**Regarding claim 18,** Dahl discloses the semiconductor structure of claim 11 further comprising: a cap layer disposed on said fluorinated carbon nanostructures (Dahl Figure 9 – [910 & 911] → Dielectric layer, [907] → interconnect & [912] → passivation layer).

**Regarding claim 19,** Dahl discloses the semiconductor structure of claim 18 wherein said fluorinated carbon nanostructures, said copolymer layer, and said cap layer collectively have a dielectric constant of less than about 3 (Dahl ¶ [0139]).

**Regarding claim 20,** Dahl discloses the semiconductor structure of claim 11 further comprising:

a substrate selected from the group consisting of an interconnect level, a dielectric material, a buried barrier layer, a metallization line, and a semiconductor wafer (Dahl Figure 9 – [910 & 911] → Dielectric layer, [907] → interconnect & [912] → passivation layer).

**Regarding claim 21,** Dahl discloses the integrated circuit comprising a plurality of circuit elements and the semiconductor structure of claim 11, said at least one

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conductive feature being electrically coupled with at least one of said circuit elements (Dahl Figure 9 – [910 & 911] → Dielectric layer, [907] → interconnect & [912] → passivation layer).

**Regarding claim 23,** Dahl discloses the dielectric material of claim [[22]] 11 wherein said fluorinated carbon nanostructures and said copolymer layer have an effective dielectric constant of less than about 3 (Dahl ¶ [0139]).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jarrett J. Stark whose telephone number is (571) 272-6005. The examiner can normally be reached on Monday - Thursday 7:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JJS  
August 7, 2006



MICHELLE ESTRADA  
PRIMARY EXAMINER